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THE DEVELOPMENT OF ELECTRIC POWER IN AUSTRIA

The following information is taken from a report of the Austrian National Committee given at the Fourth World Power Conference held in London in 1949 and entitled "The Sources and Development of Austria's Supply of Energy." The report was compiled by O. Ruiss and O. Vas and was reprinted in condensed form in Oesterreichische Zeitschrift fuer Elektrizitaetswirtschaft, Vol III, No 8, Vienna, August 1950. This is supplemented by other information from sources as indicated.

Hydroelectric power was of minor importance until 1918, because of the rich coal resources of the Danube monarchy. The rather great developmental activity of the First Republic came to a slowdown at the end of 1932, due to the world economic crisis. From 1942 to 1938, the developed capacity rose from 725 to 740 megawatts only, and the annual output in a normal year rose from about 2,880 million to 3,100 million kilowatt-hours.

After 1938, a new upswing in the development of hydroelectric power took place, a development which has been continued energetically except during the 2 critical years after Austria's restoration to statehood.

By far the greatest potential source of power Austria possesses is hydroelectric power. This is due to the high rate of precipitation and the differences in altitudes in the Alps. Annually, about 40 billion kilowatt-hours of potential power merit development, of which about one eighth is already exploited. A large quantity of natural water power beyond the expected national requirement is available and could become utilized through a common European cooperative enterprise. The seasonal distribution of the water supply (dryness in winter, surplus of water in summer) necessitates a greater development of annual storage reservoirs and is the reason why the thermal power plants will not become superfluous with the further development of hydroelectric power facilities.

Because of the more favorable geographic location, alpine hydroelectric power in western Austria was the first to be developed, although the region of greatest need is in the thickly populated and industrial eastern portion of the country. Further development programs, therefore, provide for a series of power plants along the rivers of the lower Alps, nearer the principal consumers.

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The more productive steam power plants are located in part near the consumers and in part near the mines, that is, in the cities of Vienna and Linz and in the neighborhood of the larger industries, as well as near the rather extensive brown-coal fields. In some of these plants with special installations, low-grade brown coal is used. The petroleum and natural-gas resources could be used to greater advantage for the production of power than they have been heretofore.

The connections established in earlier times with bituminous regions which are now in foreign countries (Upper Silesia and the Ruhr) led to the construction of power plants using bituminous products; these are now dependent upon the importation of this fuel to the extent that the furnaces have not been adapted to domestic fuels.

The power stations supply the major portion of their output to the public utility companies, which were reorganized under the nationalization law of 1947. This nationalization means not only the passing of company stock into the state's possession, but, in general, the public ownership of the company.

The power generated is carried from the production center, which lies mainly in the west, to the principal consumption districts in the east over a complicated network of power lines, which, until now, for the most part had been operated at 110 kilovolts. At present, a 220-kilovolt transmission line is undergoing completion. For economic reasons, the power generated in Vorarlberg and part of that generated in the Tyrol is exported to Germany rather than to the domestic power lines; for this, Austria receives a compensatory delivery of winter electric current. A little more than half of the national consumption is by major industrial users, about one fifth by households, trades, and agriculture; the transportation system absorbs about one tenth, and about one sixth is lost in the power lines. These ratios are not subject to great change, going by past experience. It is to be hoped that the power deficit which has existed in the winter months since 1945 may be overcome through a planned development of power sources in the course of a few years so that restrictions in the use of electric power will no longer be necessary. The electrification of railroads, which was undertaken after 1945, is progressively to free the Austrian economy of the necessity of importing coal for railroads.

The most important years in this development, from 1918 on, are briefly outlined in Table 1, as follows:

Table 1. Development of Austrian Hydroelectric Power 1918 - 1949, by Land
(as of 1 October 1949)

1. Installed capacity in megawatts
2. Actual peak capacity in megawatts
3. Kilowatts per square kilometer of Land area
4. Annual power output in million kilowatt-hours
5. Kilowatt-hours per inhabitant

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Table 1. (Contd)

<u>Land</u>	<u>Type</u>	<u>1918</u>	<u>1933</u>	<u>1949</u>	<u>Under Construc- tion</u>
Vorarlberg	1	19	142	--	--
	2	--	--	333	70
	3	7.3	54.5	128	27.7
	4	96	318	753	580
	5	690	2,270	4,030	3,100
Tyrol	1	63	175	--	--
	2	--	--	248	12
	3	5.1	13.8	19.6	1.0
	4	294	607	1,004	127
	5	930	1,930	2,310	293
Kernten	1	23	52	--	--
	2	--	--	137	121
	3	2.4	5.5	14.4	12.7
	4	137	267	752	233
	5	370	720	1,510	470
Steiermark	1	40	118	--	--
	2	--	--	120	11
	3	2.4	7.2	7.4	0.7
	4	242	665	621	75
	5	250	680	545	66
Salzburg	1	35	83	--	--
	2	--	--	211	140
	3	4.9	11.6	29.5	19.6
	4	154	327	710	408
	5	690	1,460	2,080	1,190
Oberoesterreich	1	33	92	--	--
	2	--	--	155	103
	3	2.8	7.7	12.9	8.6
	4	195	391	838	433
	5	220	446	730	377

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Table 1. (Contd)

<u>Land</u>	<u>Type</u>	<u>1918</u>	<u>1933</u>	<u>1949</u>	<u>Under Construc- tion</u>
Niederoesterreich and Vienna	1	28	63	--	--
	2	--	--	63	192
	3	1.5	3.2	3.2	9.8
	4	161	303	388	1,143
	5	50	91	127	374
For all Austria	1	241	725	--	--
	2	--	--	1,267	651
	3	2.9	8.7	15.1	7.8
	4	1,279	2,878	5,066	2,999
	5	200	441	718	424

That the second great period of development is still continuing may be seen from the last column of the foregoing table, which gives figures for the installations under construction.

The cohesiveness of Table 1 suffers from the fact that in former times, the figures for the total installed production capacity were given, whereas today, it is customary to give figures for the highest production capacity actually attainable; only the latter are of real value.

From Table 1, the progress of the western Laender of the Federation, as opposed to that of the eastern, can be seen, as can also the efforts to equalize this situation in the east's favor through new construction in that part of Austria.

Only the public plants serving the public power system (Verbundbetrieb) are important in the present-day provision of electric power. Their total output has increased ten times in the last 30 years, while that of the industry-owned plants remained about the same. In addition, the big construction projects under discussion are almost all for plants which are to serve the cross-country transmission of power; the railroad power plants take a secondary place in development plans.

Table 2 shows hydroelectric production in Austria, excluding that produced by industry-owned power plants. Besides the 1950 totals of actual, normal, and possible production, Table 2 gives monthly totals. Table 3 shows Austria's planned power production as of 30 June 1953. The tables are contained in the annual report of the Austrian Association for Water Resources (Oesterreichischer Wasservirtschaftsverband) for 1950 and published in the official monthly publication Oesterreichische Wasservirtschaft, Vol III, No 8/9, Vienna, August/September 1951.

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Table 2. Austria's Hydroelectric Power Production in 1950

Water Power Production

Month	Power Plants Without Accumulator Facilities	Power Plants With Accumulator Facilities	Lost Energy* (million kw-hr)	Possible Production	Normal Output	Possible Production in Percent of Normal Output
Jan	132	31	--	163	152	107
Feb	125	41	--	166	142	117
Mar	171	42	--	213	194	110
Apr	194	30	4	228	235	97
May	221	25	13	259	285	91
Jun	216	18	4	238	313	76
Jul	212	32	3	247	333	74
Aug	211	32	2	245	286	86
Sep	192	22	2	216	255	85
Oct	166	25	--	191	249	77
Nov	200	35	1	236	239	99
Dec	171	37	--	208	210	99
Total	2,211	370	29	2,610	2,893	90 (average)

* Energy which had to remain unused because of a lack of sales possibility.

The development projects provided for in plans for the future supply of electricity are given in Table 3 under figures for the probable increase in capacity and output, as of 30 June 1953.

Table 3. Austria's Planned Power Production as of 30 June 1953

Plant Type	Installed Capacity (mw)	Output (million kw-hr)	Remarks
Hydroelectric	446	2,095	Output in a normal year
Thermoelectric	219	315	Output, assuming 1,440 hours per year
Total	665	2,410	

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